ORNAMENTAL PLANT GERMPLASM CENTER

OPGC Quarterly Newsletter
Spring 2005

## Director's Introduction

The second issue of the Ornamental Plant Germplasm Center newsletter introduces our undergraduate and graduate students. We have seven Ph.D. students, two master of science students, and two undergraduates. They are playing an important part in the further development and progress of the Center. First, we depend on them to carry out research on specific topics that are relevant to our routine work in herbaceous ornamental plant germplasm acquisition, conservation, evaluation, and distribution. Secondly, they bring to the Center their exciting youthful curiosity and positiveness to answer all the questions in the world and provide the vibrant ambience to our work place. In the stories presented here they talk about who they are and what they are doing. I include their e-mail addresses for those of you who would like to communicate with them.

I want to thank the faculty at The Ohio State University — Drs. Mark Bennett, John Cardina, Miller McDonald, Claudio Pasian, and Guo-Liang Wang — and at Virginia Tech, Dr. Greg Welbaum, for helping in their advising. I also thank the many others who help the students directly or indirectly. This effort would not be possible without their willing commitment to the Center.

Finally, if you are interested in our research programs, please look at our website — http://opgc.osu.edu — and feel free to write to me at tay.9@osu.edu.

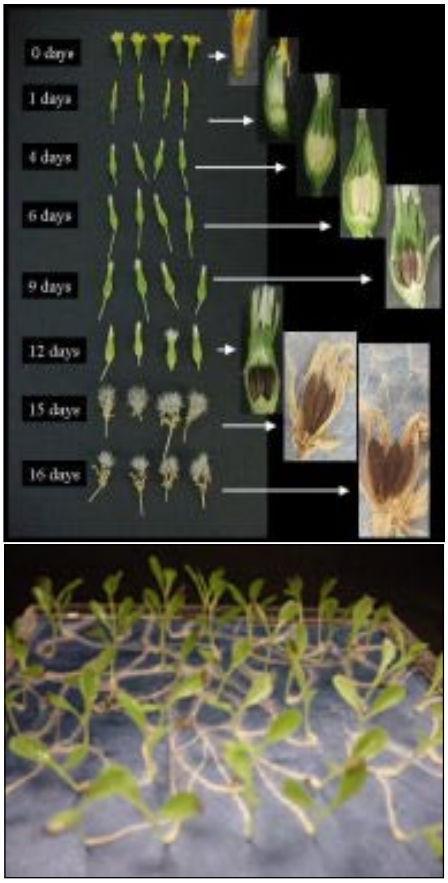
**David Tay, Ph.D.,** Director

**Lizzy Chirlin,** lizzychirlin@juno.com
**Undergraduate Student, The Ohio State University**

I am from Cincinnati, Ohio, and am a landscape horticulture major. I am involved in a two-year research project to determine if there is a species of *Dianthus* that is suitable to use as an ornamental substitute for grasses that grow between pavers. After a propagation and growth stage beginning in autumn 2004, the *Dianthus* have been planted, with replications at my home in Cincinnati and in Columbus at The Ohio State University. The *Dianthus* species will be allowed to grow at least until next spring to allow for observation. Key features include low-growing foliage and flower stalks to maintain a well-trimmed appeal. An ideal species will also be drought-, cold-, and impact-tolerant. I will continue to observe through the seasons to determine their performance and survival rate. If I can find a model species, it would have great landscaping value.

During the winter growing period, I also performed a side project to see whether seed germination rate could be detected by X-rays. Some stock Salvia seeds had obvious color variance under X-ray examination. It turned out, though, that "white" and "gray" seeds did not have any substantial germination differences.

**Samuel Contreras,** contreras.19@osu.edu
**Ph.D. Student, The Ohio State University**




I am a Fulbright Scholar from Chile, where I work as faculty in the Pontificia Universidad Católica. My main area of interest is the physiology of seeds and vegetable species. This is my second year in the Department of Horticulture and Crop Science at Ohio State. My thesis project is about how environmental factors during seed development affect seed germination in species from the Asteraceae family. I am working with lettuce, which fits very well as a model species to work with in the greenhouse and growth chambers. In addition, I am trying other species of ornamental value, such as *Rudbeckia* sp. and *Helianthus* spp. The main objectives of this project are to:

• Determine the effects of temperature, water availability, and daylength during seed development on dormancy, germination, and storability of *Asteraceae* species seeds.

• Investigate the mechanisms that govern the response of *Asteraceae* species seed quality to those environmental factors.

• Determine the relationships between the different components of seed quality (dormancy, germination, and storability).

In addition to these objectives, new issues have arisen from the experiments of my first season. The seed from the lettuce cultivar that I am using, cv. “Tango,” presents a marked requirement of light for germination. This requirement is affected by temperature of germination and, when light is applied for a short period after soaking, by the temperature before and after the light treatment. This behavior had been previously reported for lettuce; however, the physiological reasons for this response are not understood. I will perform experiments in order to determine the mechanisms involved in this interaction between light and temperature that controls seed germination. Also, I will study whether seed of other *Asteraceas* species present similar patterns of response to light and temperature.

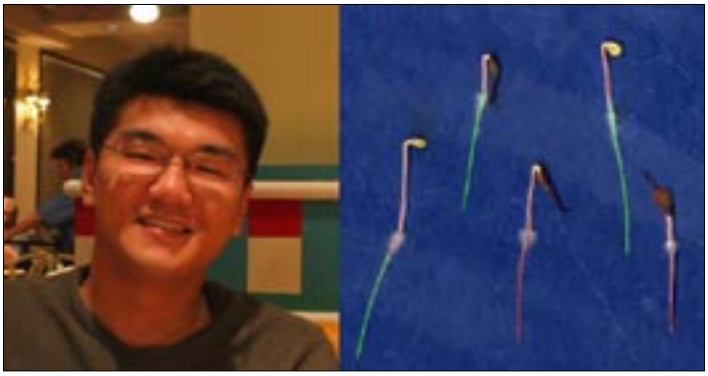
**Ling Guo,** lingguo27@hotmail.com
**Ph.D. Student, Shandong Agriculture University, China**

I am Ling Guo, curator of the Plant Introduction Department in Beijing Botanical Garden. I am a doctoral candidate at Shandong Agriculture University. My dissertation paper is about crabapple. I am trying to elucidate relationships in *Malus* species and crabapple’s cultivars by using the PCR-based TRAP (Target Region Amplified Polymorphism) marker system. I have collected *Malus* samples from the USDA, Plant Genetic Resources Unit, Cornell University, Geneva, N.Y., and from Secrest Arboretum, OSU/OARDC, in Wooster, Ohio, and have extracted DNA from them.

*Malus spectabilis* is a traditional flower in the Chinese Garden. Many ancient artists wrote poems and drew pictures of it. They are graceful but only have pink and white flowers. So I was surprised by the many colorful cultivars of crabapple I saw when I first came to the United States in 1996. Two thirds of all *Malus* species are native to China, so I want to know how so many variations developed in the United States. What is the relationship between species and cultivars?

I thank Dr. Tay who invited me here to do some work on it. I discussed my questions and what I want to do for my doctoral dissertation at the last ASHS meeting in Austin, Texas, in front of his poster of using TRAP genetic markers on Pelargonium, and he suggested I try the same method on *Malus.*

Thanks, OPGC. I appreciate David's suggestion and the opportunity to work at the OPGC.



**Xiaolei Hu,** hu.164@osu.edu
**Ph.D. Student, The Ohio State University**

I am from the city of Xuzhou in the north of Jiangsu Province, China. I graduated from Beijing Forestry University in Beijing, China.

My research interest is in the computerized seed vigor testing method, especially on ornamental species. Right now, I am doing the research work on the improvement of the Seed Vigor Imaging System developed by Professor Miller McDonald at Ohio State and its extension to ornamental species as well.

**Ka Yeon Jeong,** jeong.52@osu.edu
**M.S. Student, The Ohio State University**

Begonia, one of the priority genera of OPGC, is one of the most valuable floricultural crops for indoor and outdoor uses. About 1,500 begonia species have been reported in the world. Diverse begonia species require different environmental conditions such as substrate pH, EC, and shading levels for successful begonia culture. I am researching the responses of six begonia species, conserved in the OPGC, to different substrate pH, EC, and shading levels in greenhouse and growth chamber environments.

**Jing Luo,** luo.59@osu.edu
**Ph.D. Student, The Ohio State University**

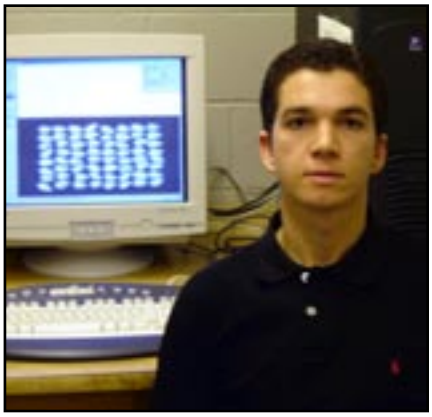
My name is Jing Luo, and I come from Shanghai, China. I got my Bachelor degree of Life Science in Fudan University, and I'm now pursuing a Ph.D. degree. I'm interested in weed biology and weed ecology, especially the biological traits that make a plant species become weedy. Phenotypic plasticity is the trait I'm now studying. Phenotypic plasticity is the property of a given genotype to produce different physiological or morphological phenotypes in response to different environments. This trait is especially important for plants because plants cannot move around like animals — plants have to adapt to the environment where the seeds landed. Phenotypic plasticity is also important for weeds because weeds should be able to survive in various kinds of environments. My hypothesis is that species that show more plasticity in response to environmental changes are more likely to become weedy. In order to test this hypothesis, The genera I will study are *Taraxacum* and *Abutilon;* I will compare the performance of several species (same genus) in different environments. Some of the species are weedy, some not. I want to test whether weedy species show higher phenotypic plasticity than non-weedy species.

**Alice Mweetwa,** mweetwam@vt.edu
**Ph.D. Student, Virginia Tech**

I am a Ph.D. student in the Department of Horticultural Sciences at Virginia Polytechnic and State University. I am originally from central Africa, Zambia. I have worked on Micropagation of *Ipomea batatas* using modified Murashige and Skoog medium (1962). I have also worked on the effect of time of harvest on quality and potential storability of soybean seed. I have worked on the creation of an inventory of agricultural persistent organic pollutants in Zambia on behalf of the Environmental Council of Zambia in order to fulfill the requirement for the Stockholm Convention (2001).

I am currently working on creating a protocol for the long-term storage of *Phalaenopsis* orchid seed. This work will involve the investigation of effect of stage of physiological development of pods on the initial quality and long-term storage of seed. Different seed drying, cleaning, sterilization, and vitrification procedures will be investigated. Molecular determinants of quality and potential storability will be investigated at each physiological stage. This work will also involve the use of different storage conditions and periods. So far, different *Phalaenopsis* cultivars have been pollinated, and pods to be used in this experiment are currently developing.

**Rafael Ribas Otoni,** ribasotoni@yahoo.com.br
**Undergraduate Student, University Federal of Lavras, MG, Brazil**



I have been working with seeds since 2002, and I think that is a very interesting area to research because seeds are the beginning of plant life, so good seeds are the first step to obtaining good plants. In the whole process of crop production, seeds are one of the steps that require less financial investment, compared to insecticide and herbicide use, but bad seeds can decrease field production substantially. With our research we can contribute to increasing food production in the world without needing to increase the area, and without spending a lot of money, only using seeds with high vigor and good genetic character.

I decided to come to Ohio State University to learn more about seed assessment, especially the use of the Image System on vigor assessment. I am now working with cotton seeds using OPGC's X-ray machine and the Seed Vigor Imaging System in order to make the use of X-ray a widespread method to assess seed vigor. X-ray technology is a rapid, easy, objective, and, more importantly, nondestructive method.

**Rose Palumbo,** palumbo.27@osu.edu
**Ph.D. Student, The Ohio State University**

I have been working on a phylogeny of the *Pelargonium* collection, which includes approximately 870 accessions. First, I did some preliminary studies on a small subset of the collection, and since that was successful, I am now expanding the experiment to the entire collection. I will be analyzing the Pelargoniums by comparing the banding patterns from TRAP (Target Region Amplified Polymorphism) reactions, which combine the use of a primer that is fixed to a target gene and an arbitrary primer. The results should show the variation in the population related to the gene of interest. The primers we are using for the initial screening have already been tested on sunflower by Dr. Hu at the USDA-ARS Northern Crop Sciences Laboratory. The 96-well

DNA extraction kit from Qiagen was essential to getting my DNA extracted efficiently and completed before I spent spring break visiting Dr. Hu in Fargo, N.D. During the next month I will be analyzing the data I collected. The results will be used to select a smaller population, which we will analyze in a similar test targeting a mite resistance gene from *Pelargonium.* We will be presenting the results of this analysis at the ASHS meeting in July.

**Roel C. Rabara,** rabara.1@osu.edu
**M.S. Student, The Ohio State University**

**Moisture isotherm, desiccation, and storage of seeds**

I am a graduate student from the Philippines working on my master's degree in horticulture under the seed biology program. In the Philippines, I worked at the National Plant Genetic Resources Laboratory of the Institute of Plant Breeding, which is actively involved in the conservation of tropical fruit species, especially species of *Mangifera* and *Musa*.

My research involves determination of moisture isotherms, desiccation tolerance in seeds, and storability of ultra-dried seeds. Water sorption isotherms will be constructed on ornamental crops such as white upland aster (*Aster ptarmicoides* (Ness) Torr and Gray), Texas lupine (*Lupinus texensis* Hook) and French marigold cv. 'Boy Golden' *(Tagetes patula* L.) and crops such as soybean cv. 'Apex' (*Glycine max* L.) and lettuce cv. 'Salinas 88' (*Lactuca sativa* L.) which will serve as control crops. This will be done by storing the seeds in different saturated salt solutions at four temperatures.

The experiment on storage will determine the viability of seeds when stored at low moisture content and in different storage conditions (temperature and relative humidity). The experiments will involve drying the seeds at a very low moisture level and storing seeds in cool and ambient temperatures. To determine at what stage of seed development seeds are able to acquire desiccation tolerance, developing seeds will be assessed for their sensitivity to desiccation. Sugar accumulation will also be measured to determine the relationship with desiccation.

Figure 1. Lettuce cv. 'Tango' grown in the greenhouse that will be used in the desiccation sensitivity of developing seeds.

Figure 2. Lettuce cv. 'Salinas 88' germinated for vigor test using the SVIS.

**Susan Stieve,** stieve.1@osu.edu
**Ph.D. Student, The Ohio State University**

I am pursuing my Ph.D. in the area of seed biology with David Tay and Miller McDonald as my co-advisors. I have completed my course work and am now focusing on organizing my research. This spring I collected 50 accessions of wild *Viola* species in Ohio, Pennsylvania, Indiana, and Wisconsin, which I will use in my research. I am interested in developing descriptors for evaluation of *Viola* accessions, and researching seed production and seed dormancy of native and commercial species of *Viola.*